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EDWARDS & ANGELL, LLP			LEE, SIN J	
P.O. BOX 55874			ART UNIT	
BOSTON, MA 02205			PAPER NUMBER	
			1752	
DATE MAILED: 04/14/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/870,243

Applicant(s)

BRAINARD ET AL.

Examiner

Sin J. Lee

Art Unit

1752

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1, 2 and 7-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 7-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. In view of the amendment of March 21, 2005, previous rejection on claim 20 under 35 U.S.C. 112, second paragraph is hereby withdrawn.
2. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1, 2, and 7-21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites the limitation as to the

concentration of photoacid generator being from 5.0 to 15.0 wt.%. Claim 8 recites the limitation as to the concentration of photoacid generator being from 5.0 to 12.0 wt.%. There is no support for these ranges because *applicants changed the number of significant figures without proper support in the original disclosure.*

***Claim Rejections - 35 USC § 102***

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 7/1, 8/1, 11/1-15/1, and 19/1-21/1 are rejected under 35 U.S.C. 102(e) as being anticipated by Jung et al (6,391,518 B1).

In Example 14, Jung teaches a photoresist composition containing a polymer obtained from his Example 2 (10 g) and triphenylsulfonium trifluoromethanesulfonate (in the amount of 1.12 g, which means that the photoacid generator is used in 10 wt% based on the weight of total solids), and triphenylsulfonium trifluoromethanesulfonate is a photoacid generator which produces CF<sub>3</sub>SO<sub>3</sub>H (a perfluoroalkyl sulfonic acid as well as a halo-alkyl sulfonic acid) upon exposure. After coating the composition onto a silicon wafer, the coated wafer is exposed to light by using ArF laser exposing device and then developed to obtain a resist pattern. Jung clearly states within Example 14 that “[a]lternatively, KrF, E-beam, **EUV**, ion-beam, X-ray, VUV (vacuum ultraviolet) or ion beam may be used *instead of* ArF as a light source.” Based on this teaching, one of ordinary skill in the art would immediately envisage using EUV (since there are only a few alternatives) instead of ArF as a light source in Jung’s Example 14. Therefore,

Jung teaches present inventions of claims 1, 7, 8, 11, 13-15, 20 and 21 (*Jung's polymer made in his Example 2 does not contain acetal, ketal or ortho ester groups*).

With respect to present claim 12, Jung teaches (col.7, lines 15-21) that as his photoacid generator, *either* an onium type (such as triphenylsulfonium trifluoromethanesulfonate) *or* a sulfide type photoacid generator can be used. Based on this teaching, one of ordinary skill in the art would immediately envisage using a sulfide type photoacid generator (which is non-ionic) instead of triphenylsulfonium trifluoromethanesulfonate in Jung's Example 14. Therefore, Jung teaches present invention of claim 12.

With respect to present claim 19, in his Example 15, Jung states that the same procedure according to his Example 14 was repeated but using the polymer obtained from Example 3 instead of that from Example 2, and the polymer of Example 3 contains acetal groups in the structure. Therefore, Jung also teaches present invention of claim 19.

7. Claims 1, 2, 7, 8, and 11-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen et al (6,103,447).

Chen teaches (col.1, lines 7-17, col.3, lines 3-12, lines 15-22) a positive tone chemically amplified resist system for use in mid-UV, deep-UV, **extreme UV**, X-ray, and e-beam lithography comprising (a) a polymer resin composition (a blend of at least two miscible aqueous base soluble polymer resins, one of which is partially protected with a high activation energy protecting group and the other of which is partially protected with a low activation energy protecting group), (b) acid generator, and (c) a solvent. As the

Art Unit: 1752

polymer resin protected with a high activation energy protecting group, Chen teaches, for example in Example 5, a terpolymer of *hydroxystyrene*, *styrene*, and *tertiary butyl acrylate*, and as the polymer resin protected with a low activation energy protecting group, Chen teaches methoxycyclohexane-protected polyhydroxystyrene polymer (*which has a ketal moiety*) in Example 5. Chen teaches (col.7, lines 10-14) that his chemically amplified resist system preferably comprises from about 0.005 to about 10 wt% of the acid generator. *Since 10 wt% is clearly disclosed in the reference as the higher limit of the range*, one of ordinary skill in the art would immediately envisage using 10 wt% of the acid generator in Chen's chemically amplified resist system.

Therefore, Chen teaches present range of 5.0-15.0 wt% (*Chen also discloses the use of 5 wt% of photoacid generator in his Example 4*). Although in Example 5, Chen exposes his resist film to DUV light, since Chen clearly states that his chemically amplified resist system is for use in mid-UV, deep-UV, **extreme UV**, X-ray, and e-beam lithography (and since there are only a few alternatives of light source listed), one of ordinary skill in the art would immediately envisage exposing Chen's resist coated on the silicon wafer to extreme UV. Therefore, the prior art teaches present inventions of claims 1, 2, 7, 8, 16-19.

With respect to present claims 11 and 13-15, Chen teaches (see Example 5) the use of di(t-butylphenyl)iodonium perfluorooctane sulfonate as one of the examples for his photoacid generator. Therefore, the prior art teaches present inventions of claims 11 and 13-15.

With respect to present claim 12, Chen teaches (col.6, lines 7 and 8) that nitrobenzyl compound (as well as onium salts, sulfonates, carboxylates) can also be used as his photoacid generator. Based on this teaching, one of ordinary skill in the art would immediately envisage using nitrobenzyl compound as Chen's photoacid generator (since there are only a few listed in col.6, lines 7-8). Therefore, Chen teaches present invention of claim 12.

With respect to present claim 20, Chen teaches that examples of low activation energy protecting groups that can be used in his invention include cyclic acetals, aliphatic or cyclic *ketals* and *silylethers* (see col.4, lines 53-58). Based on this teaching, one of ordinary skill in the art would immediately envisage (since there are only several examples listed) using a silylether group-protected polyhydroxystyrene polymer as his polymer resin protected with a low activation energy protecting group, instead of the methoxycyclohexane-protected polyhydroxystyrene polymer which is used in Chen's Example 5. Therefore, Chen teaches present invention of claim 20.

***Claim Rejections - 35 USC § 103***

8. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

9. Claims 9/1 and 10/1 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jung et al (6,391,518 B1).

As discussed above in Paragraph 6, in his Example 4, Jung uses 10 wt% of photoacid generator based on the weight of total solids. It is the Examiner's position that the amount of 10 wt% taught by Jung is close enough to the lower end of present

range of *at least about 12 wt%* in claim 9 and to the lower end of present range of *11-15 wt%* in claim 10 that one skilled in the art would have expected them to have the same properties. Thus, the prior art's teaching of 10 wt% would render present ranges of claims 9 and 10 *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Titanium Metals Corporation of America v. Banner, 227 USPQ 773 (Fed. Cir. 1985). Therefore, Jung's teaching would render obvious present inventions of claims 9 and 10.

10. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,103,447).

As discussed above in Paragraph 7, Chen teaches the use of 10 wt% of photoacid generator. It is the Examiner's position that the amount of *10 wt%* taught by Chen is close enough to the lower end of present range of *at least about 12 wt%* in claim 9 and to the lower end of present range of *11-15 wt%* in claim 10 that one skilled in the art would have expected them to have the same properties. Thus, the prior art's teaching of 10 wt% would render present ranges of claims 9 and 10 *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Titanium Metals Corporation of America v. Banner, supra. Therefore, Chen's teaching would render obvious present inventions of claims 9 and 10.



11. Claims 1, 2, 7, 8, 11-18, 20, and 21 are rejected under 35 U.S.C. 103(a) as being obvious over Barclay et al (6,492,086 B1).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

In Example 8 (see also, col.1, lines 6-11), Barclay teaches a chemically amplified positive-acting photoresist composition comprising phenol/styrene/2-methyladamantyl methacrylate terpolymer and di-t-butyl phenyl iodonium camphorsulfonate in the amount of *solid ratio of 4.72*. Barclay spin-coats the photoresist composition onto a silicon

wafer and then expose it with a KrF laser. Barclay clearly states (col.13, lines 33-36) that his resists also will be useful for exposure with E-beam exposure, and **extreme UV exposure**. Based on this teaching, it would have been obvious to use extreme UV to expose Barclay's photoresist-coated silicon wafer in Example 8 with a reasonable expectation of obtaining a high-resolution relief image. The amount of solid ratio of 4.72 for the photoacid generator as taught by Barclay is close enough to the lower end of present range of 5.0 to 15.0 wt% that one skilled in the art would have expected them to have the same properties. Thus, the prior art's teaching of solid ratio of 4.72 would render present range of claim 1 *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Titanium Metals Corporation of America v. Banner, supra. For the same reason, the prior art's teaching of solid ratio of 4.72 would render present ranges of claims 7 and 8 *prima facie* obvious. Therefore, Chen's teaching would render obvious present inventions of claims 1, 2, 7, 8, 11, 13, 16-18, 20, and 21.

With respect to present claims 12, 14, and 15, Barclay teaches (col.11, lines 29-50, col.12, lines 19-26) that as his photoacid generator, N-[(perfluorooctanesulfonyl)oxy]-5-norbornene-2,3-dicarboximide (a non-ionic compound) as well as iodonium compounds having anions of perfluorooctanesulfonate or perfluorobutanesulfonate can also be used. Therefore, Barclay's teaching would render obvious present inventions of claims 12, 14, and 15.

***Response to Arguments***

12. Applicants traverse present rejection on claims 1, 2, and 7-21 under 35 U.S.C. 112, first paragraph (see Paragraph 4 above) by arguing that there is support for the present limitation of claim 1 as to the concentration of photoacid generator being from 5.0 to 15.0 wt.% and present limitation as to the concentration of photoacid generator being from 5.0 to 12.0 wt.%. However, although there is support for 5 to 15 wt.% (and for 5 to 12 wt.%) in the original disclosure, there is no support for 5.0 to 15.0 wt.% or 5.0 to 12.0 wt.%.

Applicants argue that since Jung provides no examples of a photoresist composition on a substrate that is exposed to EUV radiation, Jung does not provide sufficient enablement for other types of radiation besides ArF. The Examiner disagrees. As explained above in Paragraph 6, after Jung states in his Example 14 that his coated wafer is exposed to ArF laser, Jung clearly states within the same Example 14 that “[a]lternatively, KrF, E-beam, **EUV**, ion-beam, X-ray, VUV (vacuum ultraviolet) or ion beam may be used *instead of* ArF as a light source.” Based on this teaching, one of ordinary skill in the art would immediately envisage using EUV (since there are only a few alternatives) instead of ArF as a light source in Jung’s Example 14.

Applicants argue that since Chen’s provided examples utilize acid generators of 4% by weight and since Chen examples provide no exemplification of EUV radiation in the method of forming photoresists, Chen examples do not anticipate the present claims. The Examiner disagrees. Chen states (see col.7, lines 10-14) that *preferably*, his photoacid generator is used in the amount of 0.005 to 10 wt.%, *thus clearly*

*disclosing* the amount of “10 wt.%” within his teaching. Thus, it is the Examiner’s position that Chen teaches present range of 5.0 to 15.0 wt% (besides, as pointed above in Paragraph 7, Chen also discloses the use of 5 wt% of photoacid generator in his Example 4). Also, Chen clearly states that his chemically amplified resist system is for use in mid-UV, deep-UV, **extreme UV**, X-ray, and e-beam lithography, and since there are only a few alternatives of light source listed, one of ordinary skill in the art would immediately envisage exposing Chen’s resist coated on the silicon wafer to extreme UV.

With respect to the present rejection on claims 9 and 10 under 35 U.S.C. 103(a) over Jung et al or Chen et al, Applicants argue that notably enhanced resolution of a resist image using EUV is surprising with increased levels of photoacid generator compounds and that the use of high photoacid generator concentrations in accordance with the present invention is counterintuitive to conventional practice and provides clearly unexpected results. However, applicants’ such arguments are not convincing since there is no evidence on the record that supports such contention.

With respect to present rejection under 35 U.S.C. 103(a) over Barclay et al, Applicants argue that there is no suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify the cited reference to arrive at the claimed invention, nor is there a reasonable expectation of success. However, as explained above in Paragraph 11, although Barclay uses a KrF laser in his Example 8, Barclay clearly states (col.13, lines 33-36) that his resists will also be useful for exposure with E-beam exposure, and **extreme UV exposure**. Based on this teaching, it would have been obvious to one of ordinary skill in the art to

Art Unit: 1752

use extreme UV to expose Barclay's photoresist-coated silicon wafer in his Example 8 with a *reasonable expectation of obtaining a high-resolution relief image*. Therefore, the reference does provide a suggestion or a motivation of using the extreme UV exposure in Barclay with a reasonable expectation of success. Also, as discussed above in Paragraph 11, it is the Examiner's position that the amount of solid ratio of 4.72 for the photoacid generator as taught by Barclay is close enough to the lower end of present range of 5.0 to 15.0 wt% that one skilled in the art would have expected them to have the same properties. Thus, the prior art's teaching of solid ratio of 4.72 would render present range of claim 1 *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Titanium Metals Corporation of America v. Banner, supra. Therefore, *in the absence of showing of superior, unexpected results of present range*, it is still the Examiner's position that the prior art's teaching of solid ratio of 4.72 for the photoacid generator renders present range of claim 1 *prima facie* obvious. Applicants also argue that notably enhanced resolution of a resist image using EUV is surprising with increased levels of photoacid generator compounds and that the use of high photoacid generator concentrations in accordance with the present invention is counterintuitive to conventional practice and provides clearly unexpected results. However, applicants' such arguments are not convincing since there is no evidence on the record that supports such contention.

Applicants argue that the earlier filed Rule 132 Declaration of Brainard shows superior performance of the present photoresist compounds and that such showing

further rebuts any prima facie case of obviousness that may be contended. As discussed previously, Brainard's Declaration was carefully considered but was found to be unpersuasive in showing unexpected superior results of present invention. First of all, the comparison was not made to the closest prior art. An affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. See MPEP 716.02(e), citing In re Burckel, 582 F.2d 1175, 201 USPQ 67 (CCPA 1979). Where the comparison is not identical with the reference disclosure, deviations therefrom should be explained, In re Finley, 174 F.2d 130, 81 USPQ 383 (CCPA 1949). *For example*, the resins shown in Tables A and B are different from those of Jung et al, Barclay et al, or Chen et al (Chen uses a blend of two polymer resins). Secondly, the comparison was not made to be commensurate in scope with claimed invention. The showing of unexpected results must be reviewed to see if the results occur *over the entire claimed range*. See MPEP 716.02(d), citing In re Clemens, 622 F.2d 1029, 1036, 206 USPQ 289, 296 (CCPA 1980). Tables A and B do not show the presently claimed amount of 5.0-15.0 wt.% beyond 8 wt.%. Also, in order to establish unexpected results over a claimed range, applicants should compare a sufficient number of tests *both inside and outside* the claimed range to show the criticality of the claimed range, In re Hill, 284, F.2d 955, 128 USPQ 197 (CCPA 1960), and applicants did not do so. Finally, applicants argue that the data shown in Figure 2 indicate that the higher PAG loadings damage the imaging capability of DUV resists, yet improve the performance of EUV resists in terms of sensitivity and/or LER. However, it seems that there is not much difference in the cross-sectional SEMS shown in Fig.2 (for DUV imaging) between the lower amount of

Art Unit: 1752

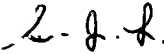
the PAG and the higher amount of the PAG. Also, it seems that there is no clear distinction in terms of LER (shown in Table B for EUV imaging) between the lower amount of the PAG and the higher amount of the PAG.

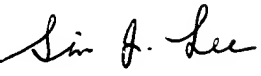
For the reasons set forth above, present rejections over Jung, Chen and Barclay still stand.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
S. Lee  
April 12, 2005

  
Sin J. Lee  
Patent Examiner  
Technology Center 1700